SINCGARS SIP IP Network System

Software Implementation

of

MIL-STD-188-220A

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MIL-STD-188-220A Implementation in the SINCGARS System Improvement Program (SIP) Internet Protocol (IP) Network System

1 Introduction. The latest published version of the MIL-STD-188-220A is dated 27 July 1995. This is the baseline reference used in this document to detail the implementation provided in the SINCGARS SIP IP Network System. The Joint Services Combat Net Radio (CNR) Implementors Working Group is continuing in its mission to refine the MIL-STD-188-220A. This working group meets approximately every 6-8 weeks to address modifications/corrections and/or improvements to the standard. A new "draft" standard is released after each meeting to capture changes. As such, while the MIL-STD-188-220A has continued to "evolve" , the SINCGARS SIP IP Network System implementation, completed in November 1995, was baselined on the latest published version, 27 July 1995, of the standard. While attempts have been made to keep pace with the evolution of MIL-STD-188-220A, software development and testing requirements do not permit the changing of software coding as frequently as the changing of the written word.

1.1 Purpose. The purpose of this document is to provide information regarding the implementation of the 27 July 1995 MIL-STD-188-220A physical, data link, and intranet layers in the SINCGARS SIP IP Network System.

1.2 Scope. This document contains the IIN combat net radio protocol implementation deliverables for Task Force XXI. This document supersedes the previous document "ESPD MIL STD 188-220() Implementation Matrix", IIN Document no. 1570535.

2 Applicable Documentation.

MIL-STD-188-220A	Military Standard: Interoperability Standard for Digital Message Transfer Device Subsystems, 27 July 1995.

3 Implementation Details. The MIL-STD-188-220A standard is comprised of protocols at Layers 1-3 of the ISO OSI model. The following layers will be addressed in separate sections of this document: Layer 1 (Physical Layer); Layer 2 (Data link Layer); Layer 3 (Intranet Layer and Subnetwork Dependent Convergence Function (SNDCF)). The MIL-STD-188-220A paragraph number appears in parenthesis after each paragraph title. Italicized text indicates MIL-STD-188-220A functionality which is not implemented in the SINCGARS SIP IP Network System.

3.1 Physical Layer (5.1). The MIL-STD-188-220A does not address the electrical and mechanical aspects of the physical layer. These are left to be defined by documents of the individual digital circuit-terminating equipment (DCE). The MIL-STD-188-220A does, however, address the control functions required to activate, maintain and deactivate the physical layer connections between DTE and DCE.

3.1.1 Transmission Channel Interfaces (5.1.1). As permitted by MIL-STD-188-220A, the transmission channel used by the SINCGARS SIP IP Network System is a radio link provided by the SINCGARS SIP RT operated in packet mode.

3.1.1.1 Non-return-to-zero Interface (5.1.1.1). The non-return-to-zero interface is not implemented in the SINCGARS SIP IP Network System.

3.1.1.2 Frequency Shift Keying Interface for Voice Frequency Channels (5.1.1.2). The FSK for voice frequency channels is not implemented in the SINCGARS SIP IP Network System.

3.1.1.3 Frequency Shift Keying Interface for Single Channel Radio (5.1.1.3). The FSK for single channel radio is not implemented in the SINCGARS SIP IP Network System.

3.1.1.4 Conditioned Diphase (CDP) Interface (5.1.1.4). The CDP interface is not implemented in the SINCGARS SIP IP Network System.

3.1.1.5 Differential Phase Shift Keying Interface for Voice Frequency Channels (5.1.1.5). The DPSK interface is not implemented in the SINCGARS SIP IP Network System.

3.1.1.6 Packet Mode Interface (5.1.1.6). The packet mode interface is implemented as specified in 5.1.1.6.1 through 5.1.1.6.3 and 6.3.2.1.

3.1.1.7 Amplitude Shift Keying (ASK) (5.1.1.7). The ASK interface is not implemented in the SINCGARS SIP IP Network System.

3.2 Physical Layer Protocol (5.2). The physical layer protocol defines the framing and procedures used at the MIL-STD-188-220A physical layer.

3.2.1 Physical Layer Protocol Data Unit (5.2.1). There are three frame structures specified for use in Figure 4 of MIL-STD-188-220A on page 5-4. The use of a particular frame type is dependent on the mode of operation used. The SINCGARS SIP IP Network System implementation provides the packet mode of operation which means that transmission frame structure 4c (Figure 4), transmission frame structure without COMSEC, is used. Transmission frame structures 4a and 4b (Figure 4 and 5.2.1.1) are not implemented in the SINCGARS SIP IP Network System.

3.2.1.1 Communications Security Preamble and Postamble (5.2.1.1). The COMSEC preamble and postamble fields of frame structure types 4a and 4b are not required in the SINCGARS SIP IP Network System since COMSEC is performed in the SINCGARS SIP RT.

3.2.1.2 Transmission Synchronization Field (5.2.1.2). The structure of the transmission synchronization field is dependent on the mode of operation. The SINCGARS SIP IP Network System implementation provides the packet mode of operation which utilizes HDLC flag synchronization as defined in 5.2.1.2.3. The asynchronous and synchronous modes of operation are not implemented in the SINCGARS SIP IP Network System. The transmission synchronization field for asynchronous mode (5.2.1.2.1 and 5.2.1.2.1.1 through 5.2.1.2.1.7) and synchronous mode (5.2.1.2.2 and 5.2.1.2.2.1 through 5.2.1.2.2.3) are not implemented in the SINCGARS SIP IP Network System.

3.2.1.3 Data Field (5.2.1.3). The data field is implemented as specified in 5.2.1.3 for packet mode operations.

3.2.2 Keytime Delay (5.2.2). Keytime delay is not required for packet mode operations and is not implemented in the SINCGARS SIP IP Network System.

3.2.3 Net Access Control Related Indications (5.2.3). In the packet mode operation net status is detected by the SINCGARS SIP RT which eliminates the need for a "net busy function" implementation in the MIL-STD-188-220A software of the SINCGARS SIP IP Network System. The SINCGARS SIP RT reports net status through the X.21 physical layer interface between the RT and the SINCGARS SIP IP Network System. Signal combinations on the 'I' and 'R' leads of the X.21 interface indicate net busy with data; net busy with voice; or net idle are defined in 6.3.2.1.2 of MIL-STD-188-220A. The net busy functions described in (Appendix C) C3.1 and C3.1.1 through C3.1.3 are not implemented in the SINCGARS SIP IP Network System. The net access control algorithm implementation is addressed in detail in the implementation of Appendix C found in paragraph 6 of this document.

3.2.4 Physical Layer to Upper Layer Interactions (5.2.4). The three primitives used to convey information across the physical layer - data link layer boundary are those specified in 5.2.4 of MIL-STD-188-220A.

a. PL-Unitdata Request - This primitive functionality is used by the data link layer to enqueue a frame multiple unit (FMU) to the physical layer. The FMU consists of a Transmission Header and one or more supervisory and/or information protocol data units (PDUs). The packet mode of MIL-STD-188-220A does not include FEC, TDC, scrambling or asynchronous mode multi-dwell segments. As such, the FEC/TDC/scrambling and multi dwell segment count parameters are not used. In the current SINCGARS SIP IP Network System implementation MIL-STD-188-220A FEC, TDC and scrambling are always assumed to be OFF. Also, the asynchronous mode multi-dwell segments are not expected to be encountered in the present implementation. Any necessary FEC and TDC is performed by the SINCGARS SIP RT. The data/data length parameter is used to indicate data location and length.

b. PL-Unitdata Indication - This primitive functionality is used by the physical layer to transfer incoming FMUs to the data link layer. For the same reasons stated in 3.2.4a above, the FEC/TDC/scrambling and multi-dwell segment count parameters are not used. The data/data length parameter is used to indicated data location and length.

c. PL-Status Indication - This primitive functionality is used to pass net status information to the data link layer from the physical layer.. The Net Activity subprimitive indicates the result of the X.21 interface line activity and its implementation in the SINCGARS SIP IP Network System is compliant with the specification in this paragraph. The Transmission Status sub-primitive indicates if a data transmission is completed or if the transmission was aborted because the SINCGARS SIP RT was not able to capture the net. The transmission in process parameter is not used. As long as neither the transmission completed or transmission aborted indications have been received by the data link layer, the transmission is assumed to be in process.

3.3 Data Link Layer (5.3). There are four types of data link procedures defined for Layer 2 communications in the MIL-STD-188-220A to provide both connectionless and connection-oriented modes of operation.

Type 1 - Unacknowledged Connectionless
Type 2 - Connection-oriented
Type 3 - Coupled Acknowledged Connectionless
Type 4 - Decoupled Acknowledged Connectionless

The present SINCGARS SIP IP Network System implementation includes Types 1, 3 and 4. Historically, Types 1 and 3 have been grouped together as the exact same PDUs are used in both types, except for the poll/final bit in the control field which is set in Type 3 but left at binary zero in Type 1. Type 2 data link procedures are not implemented in the SINCGARS SIP IP Network System.

3.3.1 Transmission Header (5.3.1). The Transmission Header is implemented in the SINCGARS SIP IP Network System as specified in 5.3.1 and 5.3.1.1 through 5.3.1.3. The Transmission Header is appended before each data transmission. The framing structure of the Transmission Header is implemented to allow for support of all for permutations defined by the two T-bits. Algorithms to make use of the information provided in the Data Link Precedence and First Subscriber Number subfields are not implemented in the SINCGARS SIP IP Network System. These two subfields, used when the T-bits are set to 1 0, provide information relevant to the DAP-NAD net access scheme which is not implemented in the SINCGARS SIP IP Network System.

3.3.1.1 Selection Bits (5.3.1.1). In the present SINCGARS SIP IP Network System implementation the selection bits are all set to binary zero to indicate that Golay FEC, TDC and scrambling are not used in the packet mode of MIL-std-188-220A.

3.3.1.2 Topology Update Identifier (5.3.1.2). This subfield is implemented as specified in 5.3.1.2 of MIL-STD-188-220A.

3.3.1.3 Transmission Queue Subfield (5.3.1.3). This subfield is used to support the RE-NAD process. The DAP-NAD permutation of this subfield is not used in the SINCGARS SIP IP Network System implementation. As per discussions with the CNR Implementors WG, the Transmission queue subfield for SINCGARS SIP IP Network System is implemented as follows:

First Octet								Second Octet							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
fec	tdc	scr	TU Seq			0	1	Que Prec		Que Len				X	X

3.3.1.3.1 T-bits (5.3.1.3.1). The T-bits are implemented as specified in MIL-STD-188-220A, bits 6 and 7 as shown above,, however, only the 0 1 bit sequence (RE-NAD) has relevance in the current SINCGARS SIP IP Network System implementation.

3.3.1.3.2 Queue Precedence (5.3.1.3.2). The queue precedence component is implemented as specified in 5.3.1.3.2 of the MIL-STD-188-220A. Per CNR WG implementor's agreements, the binary equivalent of the queue precedence bits is as follows.

Precedence	Bit 8	Bit 9	Binary
Urgent	0	0	0
Priority	1	0	1
Routine	0	1	2
Reserved	1	1	3

3.3.1.3.3 Queue Length (5.3.1.3.3). The MIL-STD-188-220A queue length component is implemented as specified in 5.3.1.3.3.

3.3.1.3.4 Data Link Precedence (5.3.1.3.4). The data link precedence is relevant to the DAP-NAD net access scheme. Algorithms to use information provided in this field are not required for RE-NAD

3.3.1.3.5 First Subscriber Number (5.3.1.3.5). The first subscriber number is relevant to the DAP-NAD net access scheme. Algorithms to use information provided in this field are not required for RE-NAD.

3.3.2 Net Access Control (5.3.2). The MIL-STD-188-220A provides for five different net access control schemes: Random - Net Access Delay (R-NAD); Hybrid - Net Access Delay (H-NAD): Prioritized - Net Access Delay (P-NAD); Radio Embedded - Net Access Delay (RE-NAD); and Deterministic Adaptable Priority - Net Access Delay (DAP-NAD). In a multiple subscriber radio net a NAD scheme must be used to control the transmission opportunities of each net subscriber. The MIL-STD-188-220A does not require any particular NAD scheme to be implemented.

The SINCGARS SIP IP Network System provides the DTE support for the RE-NAD net access scheme provided by the SINCGARS SIP RT. The SINCGARS SIP IP Network System does not provide implementations of R-NAD; H-NAD; P-NAD; or DAP-NAD.

3.3.2.1 Scheduler (5.3.2.1). The net access scheduler is implemented in the SINCGARS SIP IP Network as specified in 5.3.2.1. Paragraphs in this document discussing Appendix C provide additional scheduler implementation details.

3.3.3 Types of Procedures (5.3.3). The MIL-STD-188-220A provides for the following four types of operation at the data link layer.

Type 1 - Unacknowledged Connectionless Operation
Type 2 - Connection-mode Operation
Type 3 - Acknowledged Connectionless Operation
Type 4 - Decoupled Acknowledged Connectionless Operation

For the purpose of defining types of operation, Type 1 & 3 are combined in the MIL-STD-188-220A as operational Type 1 (distinguished as Type 1 UnACK and Type 1 ACK). The Type 1

operation is mandatory for implementation. Type 2 and Type 4 operations are optional for implementation. The status of each operational type in the SINCGARS SIP IP Network System is described below.

3.3.3.1 Type 1 Operation (5.3.3.1). The Type 1 UnACK and Type 1 ACK procedures are both provided in the SINCGARS SIP IP Network System.

3.3.3.2 Type 2 Operation (5.3.3.2). The Type 2 operation is not implemented in the SINCGARS SIP IP Network System.

3.3.3.3 Type 3 Operation (5.3.3.3). As stated in the MIL-STD-188-220A, Type 3 operation is included in Type 1 operation as Type 1 ACK.

3.3.3.4 Type 4 Operation (5.3.3.4). The Type 4 operation is implemented in the SINCGARS SIP IP Network System.

3.3.4 Data Link Frame (5.3.4). The MIL-STD-188-220A data link frame is the basic data link protocol data unit (PDU). This frame type, adhered to in the SINCGARS SIP IP Network System, is based on the HDLC/ISO 8802-2 PDU structure.

3.3.4.1 Types of Frames (5.3.4.1). Three types of PDUs convey information via the MIL-STD-188-220A data link layer: Unnumbered PDU (U-PDU); Information PDU (I-PDU); and Supervisory PDU (S-PDU). The U-PDU and S-PDU types are relevant to all operational types (Type 1, 2 and 4). The I-PDU is only relevant to Type 2 operations.

3.3.4.1.1 Unnumbered Frame (5.3.4.1.1). The U-PDU types are implemented in the SINCGARS SIP IP Network System for Type 1UnACK and Type 4 operations.

3.3.4.1.2 Information Frame (5.3.4.1.2). The I-PDU type is only relevant to Type 2 operations and is not implemented in the SINCGARS SIP IP Network System.

3.3.4.1.3 Supervisory Frame (5.3.4.1.3). The S-PDU types are implemented in the SINCGARS SIP IP Network System for Type 4 operations. The S-PDUs are not relevant to Type 1 UnACK or Type 1 ACK operations.

3.3.4.2 Data Link Frame Structure (5.3.4.2). The data link frame structure is implemented in the SINCGARS SIP IP Network System as specified in Figure 11 of MIL-STD-188-220A. The total number of octets for each transmission is limited to 1500, i.e. the capacity of the SINCGARS SIP RT.

3.3.4.2.1 Flag Sequence (5.3.4.2.1). The HDLC flag sequence is implemented in the SINCGARS SIP IP Network System as specified in 5.3.4.2.1 of MIL-STD-188-220A.

3.3.4.2.2 Address Fields (5.3.4.2.2). The address fields are used in the SINCGARS SIP IP Network System, per 5.3.4.2.2 of MIL-STD-188-220A, to identify the link addresses of the source and intended destinations.

3.3.4.2.2.1 Address format (5.3.4.2.2.1). The address format implemented in the SINCGARS SIP IP Network System is as specified in 5.3.4.2.2.1 of MIL-STD-188-220A for both source and destination addresses.

3.3.4.2.2.2 Addressing Convention (5.3.4.2.2.2). The SINCGARS SIP IP Network System supports the extended address field format as indicated in Figure 12, as well as reserved, individual and global address allocation in Figure 13 of MIL-STD-188-220A.

3.3.4.2.2.1 Source and Destination (5.3.4.2.2.1). The SINCGARS SIP IP Network System provides both source and destination address fields in the MIL-STD-188-220A data link frame.

3.3.4.2.2.1.1 Source Address (5.3.4.2.2.1.1). The source address is implemented in SINCGARS SIP IP Network System as specified in 5.3.4.2.2.1.1 of MIL-STD-188-220A.

3.3.4.2.2.1.2 Destination Address(es) (5.3.4.2.2.1.2). Up to sixteen data link destination addresses are supported in the SINCGARS SIP IP Network System, as specified in 5.3.4.2.2.1.2 of MIL-STD-188-220A.

3.3.4.2.2.2 Types of Addresses (5.3.4.2.2.2). Three types of data link addresses, specified in MIL-STD-188-220A, are supported in the SINCGARS SIP IP Network System These are reserved, individual and global addressing.

3.3.4.2.2.2.1 Reserved Address (5.3.4.2.2.2.1). The address 0 is reserved in SINCGARS SIP IP Network System, as indicated in 5.3.4.2.2.2.1 of MIL-STD-188-220A. The address 0 is used when valid addresses in a data link frame are nulled due to conditions such as acknowledgment receipt. Under these conditions the address 0 is ignored per 5.3.4.2.2.2.1 of MIL-STD-188-220A.

3.3.4.2.2.2.2 Special Addresses (5.3.4.2.2.2.2). Address 1 for net control and address 2 for net entry, as specified in 5.3.4.2.2.2.2 of MIL-STD-188-220A, are not supported in the SINCGARS SIP IP Network System. The use of these addresses will be more specifically defined when the mobility upgrade to Appendix E of MIL-STD-188-220A is completed by the CNR Implementors Working Group.

3.3.4.2.2.2.3 Individual Addresses (5.3.4.2.2.2.3). Individual addresses are implemented as specified in 5.3.4.2.2.2.3 of MIL-STD-188-220A.

3.3.4.2.2.2.4 Group Multicast Addresses (5.3.4.2.2.2.4). Group multicast addresses, as specified in 5.3.4.2.2.2.4, are not supported. Per 5.3.4.2.2.2.4 of the standard, these addresses are ignored when encountered due to the lack of definition on group multicast operation in the Tactical Internet.

3.3.4.2.2.2.5 Individual and Multicast Addresses Mixed (5.3.4.2.2.2.5). The SINCGARS SIP IP Network System is capable of both sending and receiving multicast and individual addresses mixed in a destination address subfield (the global address included as last destination). as specified in 5.3.4.2.2.2.5. Group multicast addresses are not supported.

3.3.4.2.2.2.6 Global Multicast Addressing (5.3.4.2.2.2.6). The data link broadcast (global multicast) “all-ones” address (address=127) is implemented in the SINCGARS SIP IP Network System per 5.3.4.2.2.2.6 of MIL-STD-188-220A. The TEST PDU is not implemented in the

SINCGARS SIP IP Network System and, as such, the TEST response procedures for the broadcast address are not implemented.

3.3.4.2.2.3 Mapping (5.3.4.2.2.3). Mapping of IP addresses to MIL-STD-188-220A data link addresses is performed by the upper layer Subnetwork Dependent Convergence Function (SNDCF) as described in 5.4.2.2 of MIL-STD-188-220A.

3.3.4.2.3 Control Field (5.3.4.2.3). The data link PDU control field values for Types 1 and 4 are implemented in the SINCGARS SIP IP Network System per Figure 14. Control field values for Type 2 are not implemented in the SINCGARS SIP IP Network System.

3.3.4.2.3.1 Type 1 Operations (5.3.4.2.3.1). The following chart indicates the status of Type 1 PDUs in the SINCGARS SIP IP Network System. Per 5.3.4.2.3.1 of MIL-STD-188-220A, the URR and URNR PDUs are used to indicate overall station status (busy/not busy).

Commands/Responses	Status
XID command	Not implemented. Presently being revised by the CNR Implementors WG
XID response	Not implemented. Presently being revised by the CNR Implementors WG
UI (ACK required) command (Type 1 ACK)	Implemented per Table VIII
UI (ACK not required) command (Type 1 UnACK)	Implemented per Table VIII
URR command	Implemented per Table VIII
URR response	Implemented per Table VIII
URNR command	Implemented per Table VIII
URNR response	Implemented per Table VIII
TEST command	Not implemented
TEST response	Not implemented

Table 1 - Type 1 PDU Control Field Value Implementation Status

3.3.4.2.3.2 Type 2 Operations (5.3.4.2.3.2). Type 2 operations and, consequently, Type 2 control field values are not implemented in the SINCGARS SIP IP Network System.

3.3.4.2.3.3 Type 4 Operations (5.3.4.2.3.3). The following chart indicates the status of Type 4 PDUs in the SINCGARS SIP IP Network System. Per 5.3.4.2.3.3 of MIL-STD-188-220A, the URR and URNR PDUs are used to indicate overall station status (busy/not busy) while the DRR and DRNR PDUs are used to indicate Type 4 station status (busy/not busy).

Commands/Responses	Status
DIA ACK required	Implemented per Table X
DRR response	Implemented per Table X
DRR command	Implemented per Table X
DRNR response	Implemented per Table X
DRNR command	Implemented per Table X

Table 2 - Type 4 PDU Control Field Value Implementation Status

3.3.4.2.3.4 Poll/Final Bit (5.3.4.2.3.4). The poll/final bit is implemented in the SINCGARS SIP IP Network System as specified in 5.3.4.2.3.4 of MIL-STD-188-220A for Type 1 PDUs. Type 4 PDUs do not require the use of the poll/final bit. Type 2 operations and consequently, Type 2 poll/final bit use, are not implemented in the SINCGARS SIP IP Network System.

3.3.4.2.3.5 Sequence Numbers (5.3.4.2.3.5). Type 2 operations and consequently, Type 2 sequence numbers,, are not implemented in the SINCGARS SIP IP Network System.

3.3.4.2.3.6 Identification Numbers (5.3.4.2.3.6). The Type 4 identification number is implemented in the SINCGARS SIP IP Network System as specified in 5.3.4.2.3.6 of MIL-STD-188-220A.

3.3.4.2.3.7 Precedence (5.3.2.3.7). The Type 4 precedence level bits are implemented in the SINCGARS SIP IP Network System as specified in 5.3.4.2.3.7 of MIL-STD-188-220A. The mapping of Type 4 precedence levels to IP precedence levels is per Table XI and 5.3.16 of MIL-STD-188-220A.

3.3.4.2.4 Information Field (5.3.4.2.4). The information field may be present in the UI or DIA PDU in the SINCGARS SIP IP Network System implementation. The total length of the MTU allowed in packet mode operation is 1500 octets. The MTU structure, consisting of a transmission header and either a single or multiple concatenated PDUs, is implemented as per 5.3.4.2 of MIL-STD-188-220A.

3.3.4.2.5 Frame Check Sequence (5.3.4.2.5). The 32-bit frame check sequence in the SINCGARS SIP IP Network System is implemented per 5.3.4.2.5 of MIL-STD-188-220A.

3.3.4.3 Data Link PDU Construction (5.3.4.3). The SINCGARS SIP IP Network System adheres to the procedures for data link PDU construction described in 5.3.4.3 of MIL-STD-188-220A. As permitted in 5.3.14 of MIL-STD-188-220A, FEC and TDC are not applied to PDU construction, as these features are performed by the SINCGARS SIP IP Network System.

3.3.4.3.1 Order-of-Bit Transmission (5.3.4.3.1). The SINCGARS SIP IP Network System performs bit ordering as specified in 5.3.4.3.1 of MIL-STD-188-220A. As a point of clarification, when the control field is two octets, this field is transmitted LSB of each octet first.

3.3.4.3.2 Zero-bit Insertion Algorithm (5.3.4.3.2). The SINCGARS SIP IP Network System performs zero-bit insertion as specified in 5.3.4.3.2 of MIL-STD-188-220A.

3.3.5 Operational Parameters (5.3.5). Operational parameters are implemented for data link Types 1 and 4. Type 2 operational parameters are not implemented in the SINCGARS SIP IP Network System.

3.3.5.1 Type 1 operational Parameters (5.3.5.1). The Type 1 operational parameter is the poll/final bit which is implemented in the SINCGARS SIP IP Network System per 5.3.5.1 of MIL-STD-188-220A.

3.3.5.2 Type 2 Operational Parameters (5.3.5.2). Type 2 operational parameters are not implemented in the SINCGARS SIP IP Network System.

3.3.5.2.1 Modulus (5.3.5.2.1). The Type 2 modulus parameter is not implemented in the SINCGARS SIP IP Network System.

3.3.5.2.2 PDU-State Variables and Sequence Numbers (5.3.5.2.2). The Type 2 PDU state variable and sequence number parameters are not implemented in the SINCGARS SIP IP Network System.

3.3.5.2.2.1 Send-state variable V(S) (5.3.5.2.2.1). The Type 2 send-state variable V(S) parameter is not implemented in the SINCGARS SIP IP Network System.

3.3.5.2.2.2 Send-Sequence Number N(S) (5.3.5.2.2.2). The Type 2 send-sequence number N(S) parameter is not implemented in the SINCGARS SIP IP Network System.

3.3.5.2.2.3 Receive-State Variable V(R) (5.3..5.2.2.3). The Type 2 receive-state variable V(R) parameter is not implemented in the SINCGARS SIP IP Network System.

3.3.5.2.2.4 Receive-Sequence Number N(R) (5.3.5.2.2.2). The Type 2 receive-sequence number N(R) parameter is not implemented in the SINCGARS SIP IP Network System.

3.3.5.2.3 Poll/Final (P/F) Bit (5.3.5.2.3). The Type 2 poll/final (P/F) bit parameter is not implemented in the SINCGARS SIP IP Network System.

3.3.5.2.3.1 Poll-bit Functions (5.3.5.2.3.1). The Type 2 poll-bit function is not implemented in the SINCGARS SIP IP Network System.

3.3.5.2.3.2 Final-bit Functions (5.3.5.2.3.2). The Type 2 final-bit function is not implemented in the SINCGARS SIP IP Network System.

3.3.5.3 Type 4 Operational Parameters (5.3.5.3). The Type 4 operational parameters are implemented in the SINCGARS SIP IP Network System. Precedence is implemented as specified in 5.3.4.2.3.7 of MIL-STD-188-220A.

3.3.5.3.1 Identification Number (5.3.5.3.1). The identification number parameter is implemented in the SINCGARS SIP IP Network System per 5.3.5.3.1 of MIL-STD-188-220A.

3.3.6 Commands and Responses (5.3.6). Commands and responses are implemented in the SINCGARS SIP IP Network System for Types 1 and 4. Type 2 commands and responses are not implemented. The LSB of the data link source address, called the C/R bit, is used to distinguish between commands and responses. Per Figure 13 in MIL-STD-188-220A, a C/R bit set to binary 1 identifies the PDU as a response and a C/R bit at binary 0 identifies the PDU as a command.

3.3.6.1 Type 1 Operation Commands and Responses (5.3.6.1). The U PDU encoding for Type 1 operations are implemented per Figure 15 of MIL-STD-188-220A for UI command, URR command/response, and URNR command/response. URNR responses are not generated by the SINCGARS SIP IP Network System, although they are correctly processed when received from any other system. The U PDU encoding for XID command/response and TEST

command/response are not supported because these U PDU types are not implemented in the SINCGARS SIP IP Network System.

3.3.6.1.1 Unnumbered Information Command (5.3.6.1.1). The UI PDU is implemented in the SINCGARS SIP IP Network System as specified in 5.3.6.1.1 of MIL-STD-188-220A.

3.3.6.1.2 Unnumbered Receive Ready Command (5.3.6.1.2). The URR command PDU is implemented in the SINCGARS SIP IP Network System as specified in 5.3.6.1.2 of MIL-STD-188-220A.

3.3.6.1.3 Unnumbered Receive Not Ready Command (5.3.6.1.3). The URNR command PDU is transmitted to alert the neighbor stations that the sending station is busy and cannot receive any UI or DIA PDUs. As such, the URNR PDU is sent to the global destination address

3.3.6.1.4 Exchange Identification Command (5.3.6.1.4). The XID command PDU is not implemented in the SINCGARS SIP IP Network System.

3.3.6.1.5 Test Command (5.3.6.1.5). The TEST command PDU is not implemented in the SINCGARS SIP IP Network System.

3.3.6.1.6 Unnumbered Receive Ready Response (5.3.6.1.6). The URR response PDU is implemented in the SINCGARS SIP IP Network System as specified in 5.3.6.1.6 of MIL-STD-188-220A.

3.3.6.1.7 Exchange Identification Response (5.3.6.1.7). The XID response PDU is not implemented in the SINCGARS SIP IP Network System.

3.3.6.1.8 Test Command (5.3.6.1.8). The TEST response PDU is not implemented in the SINCGARS SIP IP Network System.

3.3.6.1.9 Unnumbered Receive Not Ready Response (5.3.6.1.9). The URNR response PDU is not currently implemented in the SINCGARS SIP IP Network System, as specified in 5.3.6.1.9 of MIL-STD-188-220A. Nevertheless, when other system sends a URNR response PDU, it is correctly processed by the SINCGARS SIP IP Network System.

3.3.6.2 Type 2 Operation Commands and Responses (5.3.6.2). Type 2 operations are not implemented in the SINCGARS SIP IP Network System and, as a consequence, the associated commands and responses are not supported.

3.3.6.2.1 Information Transfer Format Command and Response (5.3.6.2.1). The Type 2 Information PDU (I-PDU) command and response is not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.2 Supervisory Format Commands and Responses (5.3.6.2.2). The Type 2 Supervisory PDU (S-PDU) commands and responses are not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.2.1 Receive Ready Command and Response (5.3.6.2.2.1). The Type 2 Supervisory Receive Ready (RR) PDU (S-PDU) command and response are not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.2.2 Reject Command and Response (5.3.6.2.2.2). The Type 2 Supervisory Reject (REJ) PDU (S-PDU) command and response are not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.2.3 Receive Not Ready Command and Response (5.3.6.2.2.3). The Type 2 Supervisory Receive Not Ready (RNR) PDU (S-PDU) command and response are not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.2.4 Selective Reject Command and Response (5.3.6.2.2.4). The Type 2 Supervisory Selective Reject (SREJ) PDU (S-PDU) command and response are not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.3 Unnumbered Format Commands and Responses (5.3.6.2.3). The Type 2 Unnumbered PDU (U-PDU) commands and responses are not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.3.1 Set Asynchronous Balanced Mode Extended Command (5.3.6.2.3.1). The Type 2 Unnumbered Set Asynchronous Balanced Mode Extended (SABME) PDU (U-PDU) command is not implemented in the SINCGARS SIP IP Network System
3.3.6.2.3.2 Disconnect Command (5.3.6.2.3.2). The Type 2 Unnumbered Disconnect (DISC) PDU (U-PDU) command is not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.3.3 Reset Command (5.3.6.2.3.3). The Type 2 Unnumbered Reset (RSET) PDU (U-PDU) command is not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.3.4 Unnumbered Acknowledgment Response (5.3.6.2.3.4). The Type 2 Unnumbered Acknowledgment (UA) PDU (U-PDU) response is not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.3.5 Disconnect Mode Response (5.3.6.2.3.5). The Type 2 Unnumbered Disconnect Mode (DM) PDU (U-PDU) response is not implemented in the SINCGARS SIP IP Network System.

3.3.6.2.3.6 Frame Reject Response (5.3.6.2.3.6). The Type 2 Frame Reject (() PDU (U-PDU) response is not implemented in the SINCGARS SIP IP Network System.

3.3.6.3 Type 4 Operation Commands and Responses (5.3.6.3). Type 4 commands and responses, consist of Information DIA PDUs and Supervisory DRR/DRNR PDUs, as per section 5.3.6.3 of MIL-STD-188-220A.

3.3.6.3.1 Unnumbered Information Transfer Format Command (5.3.6.3.1). The DIA PDU is implemented in the SINCGARS SIP IP Network System as specified in 5.3.6.3.1 and 5.3.6.3.1.1 of MIL-STD-188-220A.

3.3.6.3.2 Supervisory Format Commands and Responses (5.3.6.3.2). The DRR and DRNR PDU commands and responses are implemented in the SINCGARS SIP IP Network System as specified in 5.3.6.3.2 and Figure 21 of MIL-STD-188-220A. The DRNR response PDU is not generated by the SINCGARS SIP IP Network System. When a DRNR response is received from other system, the SINCGARS SIP IP Network System will process it correctly, as per 5.3.7.3.5.2.2 of MIL-STD-188-220A.

3.3.7 Description of Procedures By Type (5.3.7). The procedures for MIL-STD-188-220A Type 1 and Type 4 are implemented in the SINCGARS SIP IP Network System. The procedures for MIL-STD-188-220A Type 2 are not implemented in the SINCGARS SIP IP Network System.

3.3.7.1 Description of Type 1 Procedures (5.3.7.1). The SINCGARS SIP IP Network System Type 1 procedures implementation is described in 3.3.7.1.1 through 3.3.7.1.5 below.

3.3.7.1.1 Modes of operation (5.3.7.1.1). Per MIL-STD-188-220A, there is only one mode of operation for Type 1 procedures in the SINCGARS SIP IP Network System.

3.3.7.1.2 Procedures for addressing (5.3.7.1.2). Address fields are used to indicate the source and destination(s) of a transmitted PDU and the first bit of the source address is used to identify the PDU as a command or a response, per 5.3.7.1.2 in MIL-STD-188-220A. Individual and global addressing is implemented in the SINCGARS SIP IP Network System. Group addressing as well as special addressing reflecting mobility, require better definition and are not implemented in the SINCGARS SIP IP Network System.

3.3.7.1.3 Procedures for Using the P/F Bit (5.3.7.1.3). Procedures for using the P/F bit with UI PDUs is implemented in the SINCGARS SIP IP Network System. The XID and TEST PDUs are not implemented in the SINCGARS SIP IP Network System and, as such, the procedures to support the use of P/F bit with these PDUs are not supported.

3.3.7.1.4 Procedure for Logical Data Link Set-up and Disconnection (5.3.7.1.4). As specified in 5.3.7.1.4 of MIL-STD-188-220A, data link set-up and disconnection procedures are not required for Type 1 operations.

3.3.7.1.5 Procedures for Information Transfer (5.3.7.1.5). The procedures implemented in the SINCGARS SIP IP Network System for Type 1 information transfer is indicated in 3.3.7.1.5.1 through 3.3.7.1.5.11.

3.3.7.1.5.1 Sending UI Command PDUs (5.3.7.1.5.1). The UI command PDU is utilized by the SINCGARS SIP IP Network System to transfer information using MIL-STD-188-220A Type 1 procedures. When a UI (P-bit=1) PDU is sent, an acknowledgment timer is started. If all acknowledgments are not received before the ACK timer expires, the UI PDU is retransmitted to all destinations from which acknowledgments were not received. The standard indicates that all addresses from which acknowledgments were received, as well as, any group addresses and the global broadcast address are to be removed prior to resending the UI PDU. In order to avoid rebuilding the UI PDU after removing the aforementioned addresses, the SINCGARS SIP IP Network System simply nulls (changes to all binary 0's) the appropriate addresses. The effect is the same and any receiving station, in accordance with MIL-STD-188-220A paragraph 5.3.4.2.2.2.2.1 will ignore the null or "reserved" address and continue processing other addresses in the destination address field. Per MIL-STD-188-220A 5.3.7.1.5.1, this resending process is

repeated to each addressee, as needed up to N4 times, after which an acknowledgment failure is reported to the data link user, which is the Intranet Layer in the SINCGARS SIP IP Network System. A separate retransmission (N4) counter is maintained for each unicast address in the destination address field. If a URNR response is received during the ACK timer period the Intranet Layer is notified to mark that station as busy. The address of the busy station is nulled when the UI PDU is retransmitted.

3.3.7.1.5.2 Receiving UI Command PDUs (5.3.7.1.5.2). Per MIL-STD-188-220A 5.3.7.1.5.2, UI command PDUs (P-bit=0) are not acknowledged and UI command PDUs (P-bit=1) are acknowledged via the URR response PDU. The URNR response PDU is not generated by the SINCGARS SIP IP Network System when the station is in the busy condition. When the SINCGARS SIP IP Network System exceeds the Type 1 busy threshold a URNR command is transmitted to the broadcast address. Any information PDUs (e.g., UI command PDUs) received during this busy condition are discarded and not acknowledged.

3.3.7.1.5.3 Sending URR Response PDUs (5.3.7.1.5.3). Per MIL-STD-188-220A, the URR response PDU is sent only upon receipt of an UI command PDU (P-bit=1) to acknowledge that UI command PDU (P-bit=1).

3.3.7.1.5.4 Sending URNR response PDUs (5.3.7.1.5.4). Per MIL-STD-188-220A, sending the URNR response PDU to indicate a station busy status is optional. The SINCGARS SIP IP Network System does not generate the URNR response PDU to indicate a busy condition (see additional explanation in 3.3.7.1.5.2 above).

3.3.7.1.5.5 Receiving UI acknowledgment (5.3.7.1.5.5). Upon receipt of all the expected UI acknowledgments for a particular UI command PDU (P-bit=1) the acknowledgment timer shall be terminated. If all the expected UI acknowledgments are received prior to the expiration of the acknowledgment timer, those addresses for which acknowledgments were received are nulled in the UI command PDU (P-bit=1) destination address field. A received URR response PDU is used to indicate acknowledgment of the transmitted UI command PDU (P-bit=1) and an indication of a non-busy condition at the remote station. A received URNR response is used to indicate a busy condition at the remote station.

3.3.7.1.5.6 Sending URNR command PDUs (5.3.7.1.5.6). When the Type 1 busy threshold is exceeded, per MIL-STD-188-220A, the URNR command PDU is sent to the global broadcast address to indicate a busy condition at the originating station.

3.3.7.1.5.7 Receiving URNR command PDUs (5.3.7.1.5.7). The URNR command PDU is implemented as specified in 5.3.7.1.5.7 of MIL-STD-188-220A.

3.3.7.1.5.8 Sending URR Command PDUs (5.3.7.1.5.8). The URR command PDU is implemented as specified in 5.3.7.1.5.8 of MIL-STD-188-220A.

3.3.7.1.5.9 Receiving URR Command PDUs (5.3.7.1.5.9). Per MIL-STD-188-220A, receipt of the URR command PDU by the SINCGARS SIP IP Network System will clear a remote station busy condition for all PDU types. Note that the busy condition is also cleared upon expiration of the busy timer.

3.3.7.1.5.10 Using XID Command and Response PDUs (5.3.7.1.5.10). XID command and response PDUs are not implemented in SINCGARS SIP IP Network System pending completion of Appendix E revisions to support mobility.

3.3.7.1.5.11 Using Test Command and Response PDUs (5.3.7.1.5.11). Test command and response PDUs are implemented in the SINCGARS SIP IP Network System.

3.3.7.2 Description of Type 2 Procedures (5.3.7.2). MIL-STD-188-220A Type 2 procedures are not implemented in the SINCGARS SIP IP Network System.
3.3.7.3 Description of Type 4 Procedures (5.3.7.3). MIL-STD-188-220A Type 4 data link operations and the associated Type 4 procedures are implemented in the SINCGARS SIP IP Network System.

3.3.7.3.1 Mode of Operation (5.3.7.3.1). The SINCGARS SIP IP Network System supports a single mode of operation for Type 4, as specified in 5.3.7.3.1.

3.3.7.3.2 Procedure for Addressing (5.3.7.3.2). The procedures for addressing are implemented as specified in 5.3.7.3.2 except for group addressing. Group addressing is not implemented in the SINCGARS SIP IP Network System. See paragraph 3.3.4.2.2.2.4 of this document for more information regarding group addressing.

3.3.7.3.3 Procedure for Using the P/F Bit (5.3.7.3.3). Per MIL-STD-188-220A, the P/F bit is not used in Type 4 operation and, as such, is not implemented in the SINCGARS SIP IP Network System.

3.3.7.3.4 Procedure for Logical Data Link Set-up and Disconnection (5.3.7.3.4). Per MIL-STD-188-220A, set-up and disconnection procedures are not required for Type 4 operations.

3.3.7.3.5 Procedures for Information Transfer (5.3.7.3.5). The procedures implemented in the SINCGARS SIP IP Network System for Type 4 information transfer is indicated in 3.3.7.3.5.1 through 3.3.7.3.5.3 and all inclusive subparagraphs.

3.3.7.3.5.1 Sending DIA Command Frames (5.3.7.3.5.1). Type 4 DIA (information) frames are sent as specified in 5.3.7.3.5.1 of MIL-STD-188-220A.

3.3.7.3.5.2 Receive Not Ready Procedure (5.3.7.3.5.2). The procedure implemented in the SINCGARS SIP IP Network System for Type 4 receive not ready is indicated in 3.3.7.3.5.2.1 through 3.3.7.3.5.2.4.

3.3.7.3.5.2.1 Sending a DRNR Command PDU (5.3.7.3.5.2.1). Per MIL-STD-188-220A, the SINCGARS SIP IP Network System sends a DRNR command PDU to the broadcast address to indicate the sending station has exceeded the Type 4 busy threshold. The transmission of the DRNR command PDU indicates the local station cannot accept Type DIA PDUs, however, the station is capable of receiving Type 1 UI PDUs (both P-bit=0 and P-bit=1) as well as any type supervisory PDUs. Type 4 DIA traffic received while in the Type 4 busy condition is discarded and not acknowledged.

3.3.7.3.5.2.2 Receiving a DRNR Command PDU (5.3.7.3.5.2.2). The procedure for receiving a DRNR command PDU is implemented in the SINCGARS SIP IP Network System as specified in

the MIL-STD-188-220A. In addition to resuming normal transmission of Type 4 DIA PDUs to a busy station upon receipt of a DRR command PDU, the expiration of the busy timer implemented in the SINCGARS SIP IP Network System shall also permit the resumption of normal Type 4 DIA transmissions to that station.

3.3.7.3.5.2.3 Sending a DRNR Response PDU (5.3.7.3.5.2.3). The procedures for sending the DRNR response PDU are not implemented in the SINCGARS SIP IP Network System.

3.3.7.3.5.2.4 Receiving a DRNR Response PDU (5.3.7.3.5.2.4). The procedures for receiving a DRNR Response are implemented in the SINCGARS SIP IP Network System as specified in 5.3.7.3.5.2.4 of the MIL-STD-188-220A

3.3.7.3.5.3 Receive Ready Procedures (5.3.7.3.5.3). The procedure implemented in the SINCGARS SIP IP Network System for Type 4 receive ready is indicated in 3.3.7.3.5.3.1 through 3.3.7.3.5.3.2.
3.3.7.3.5.3.1 Sending a DRR PDU (5.3.7.3.5.3.1). The SINCGARS SIP IP Network System sends a DRR under the conditions specified by the MIL-STD-188-220A paragraph 5.3.7.3.5.3.1.

3.3.7.3.5.3.1.1 Sending a DRR Command PDU (5.3.7.3.5.3.1.1). Per MIL-STD-188-220A, the SINCGARS SIP IP Network System sends a DRR command PDU to clear a Type 4 busy condition established by the prior transmission of a DRNR command PDU. The DRR command does not acknowledge DIA PDUs. The URR command PDU is not sent out after the DRR command PDU.

3.3.7.3.5.3.1.2 Sending a DRR Response PDU (5.3.7.3.5.3.1.2). The SINCGARS SIP IP Network System sends a DRR response PDU under the conditions specified by the MIL-STD-188-220A paragraph 5.3.7.3.5.3.1.2.

3.3.7.3.5.3.2 Receiving a DRR Response PDU (5.3.7.3.5.3.2). The SINCGARS SIP IP Network System reacts to the reception of a DRR response PDU as specified by the MIL-STD-188-220A paragraph 5.3.7.3.5.3.2.

3.3.8 Data Link Initialization (5.3.8.1). The XID messages used for data link initialization have not been implemented in the SINCGARS SIP IP Network System pending finalization of Appendix E of MIL-STD-188-220A to support mobility.

3.3.8.1 List of Data Link Parameters (5.3.8.1). Data link parameters for Type 1 and Type 4 operations are supported in the SINCGARS SIP IP Network System, as described in the subparagraphs below. Type 2 operations and the associated Type 2 data link parameters are not supported in SINCGARS SIP IP Network System. The maximum number of octets permitted in the data link packet mode information field is indicated in 3.3.4.2.4 of this document.

3.3.8.1.1 Type 1 Logical Data Link Parameters (5.3.8.1.1) The Type 1 data link parameters are implemented as indicated below.

a. Acknowledgment Timer. The acknowledgment timer is started when a physical layer indication is received that the PDU was transmitted, as such there isn't any delay factor estimate required for the physical layer. The acknowledgment

timer (TP) is implemented as specified in Appendix C of MIL-STD-188-220A paragraph C3.3.

b. Busy State Timer. Busy state timers are maintained on a per station basis. The busy state timer for Type 1 operations is started upon receipt of a URNR PDU from a remote station. The remote station is marked as busy in the station status table maintained at the Intranet Layer. The busy state timer is restarted each time a URNR PDU is received from that remote station. Note that the busy state timer is also required, and is implemented, for Type 4 operations. Since Type 1 and Type 4 busy thresholds are at different buffer utilization levels, there is no conflict in the use of the busy timer for both Type 1 and Type 4 traffic.

c. Maximum Number of Transmissions, N4. The N4 range implemented in the SINCGARS SIP IP Network System is 0 - 5 with a default of 2, as specified in 5.3.8.1.1c of MIL-STD-188-220A.

d. Minimum Number of Octets in a PDU. The minimum number of octets in a valid data link PDU is 9 per 5.3.8.1.1d of MIL-STD-188-220A.

3.3.8.1.2 Type 2 Data Link Parameters. Type 2 operations and the associated Type 2 data link parameters are not implemented in the SINCGARS SIP IP Network System.

3.3.8.1.3 Type 4 Data Link Parameters. The Type 4 data link parameters are implemented as indicated below.

a. Acknowledgment (T1) Timer. The T1 timer is implemented in the SINCGARS SIP IP Network System per 5.3.8.1.3a of MIL-STD-188-220A.

b. Maximum Number of Transmission Attempts, N2. The N2 value is implemented in the SINCGARS SIP IP Network System per 5.3.8.1.3b of MIL-STD-188-220A.

c. K Maximum Number of Outstanding DIA Frames. The K value is implemented in the SINCGARS SIP IP Network System per 5.3.8.1.3c of MIL-STD-188-220A.

3.3.9 Frame Transfer (5.3.9). In the SINCGARS SIP IP Network System the data link layer requests the transmission of a frame by issuing a Q1_Event to the Physical Layer. This event performs the PL-unitdata request function.

3.3.9.1 PDU transmission (5.3.9.1). PDU transmission in the SINCGARS SIP IP Network System is accomplished per 5.3.9.1 of the MIL-STD-188-220A with the Q1_Event performing the PL-unitdata request function.

3.3.9.2 Data Link Concatenation (5.3.9.2). Data link concatenation is performed as specified in 5.3.9.2 of MIL-STD-188-220A while adhering to the packet mode network MTU size of 1500 bytes.

3.3.9.3 Physical Layer Concatenation (5.3.9.3). The SINCGARS SIP IP Network System does not perform physical layer concatenation.

3.3.9.4 PDU Transmissions (5.3.9.4) PDU transmissions are implemented in the SINCGARS SIP IP Network System as specified in 5.3.9.4 of MIL-STD-188-220A for data link concatenation only.

3.3.10 Flow Control (5.3.10). Type 1 and Type 4 flow control procedures are implemented in SINCGARS SIP IP Network System.

3.3.10.1 Type 1 Flow Control (5.3.10.1). The URR and URNR PDUs are used in the SINCGARS SIP IP Network System to provide busy state indications. Per MIL-STD-188-220A, this may be viewed as a flow control mechanism for Type 1 operations.

3.3.10.2 Type 2 Flow Control (5.3.10.2). Type 2 operations and the associated flow control is not implemented in the SINCGARS SIP IP Network System.

3.3.10.3 Type 4 Flow Control (5.3.10.3). Type 4 flow control is performed as specified in 5.3.10.3 of the MIL-STD-188-220A.

3.3.11 Acknowledgment and Response (5.3.11). UI and DIA PDUs are acknowledged except under the conditions specified in 5.3.11a - e.

3.3.11.1 Acknowledgment (5.3.11.1). The SINCGARS SIP IP Network System provides Type 1 and Type 4 acknowledgments.

3.3.11.1.1 Type 1 Acknowledgment (5.3.11.1.1). Type 1 UI PDUs (P-bit=1) are acknowledged by the SINCGARS SIP IP Network System. The XID and TEST PDUs are not implemented and hence, not acknowledged.

3.3.11.1.2 Type 2 Acknowledgments (5.3.11.1.2). Type 2 operations and the associated Type 2 acknowledgments are not implemented in the SINCGARS SIP IP Network System.

3.3.11.1.3 Type 4 Acknowledgments (5.3.11.1.3). Type 4 DIA PDUs are acknowledged as specified in 5.3.11.1.3 of MIL-STD-188-220A.

3.3.11.2 Response Mode. Presently, the mechanism is provided in the SINCGARS SIP IP Network System to turn the response mode on and off. Complete systems design and integration is required to specify the overall design for response mode operation to provide a “quiet mode” capability in the SINCGARS SIP IP Network System.

3.3.12 Invalid Frame (5.3.12). Invalid frames are identified in the SINCGARS SIP IP Network System per 5.3.12 of MIL-STD-188-220A.

3.3.13 Retransmission (5.3.13). Retransmission is implemented in the SINCGARS SIP IP Network System as specified in 5.3.13 of MIL-STD-188-220A.

3.3.14 Error Detection and Correction (5.3.14). Error detection and correction is provided by the SINCGARS SIP RT in the packet mode of MIL-STD-188-220A. As such, the optional error detection and correction capability specified in 5.3.14.1 through 5.3.14.3 of MIL-STD-188-220A is not implemented in the SINCGARS SIP IP Network System.

3.3.15 Data Scrambling. The conditional data scrambling capability is required for the asynchronous mode of MIL-STD-188-220A and, therefore, not implemented in the SINCGARS SIP IP Network System.

3.3.16 Link Layer Interactions (5.3.16). The means by which the data link layer of the SINCGARS SIP IP Network System interacts with the next higher layer is accomplished through the primitive functionality described in MIL-STD-188-220A for the DL_unitdata.request, DL_unitdata.indication, and DL_status.indication.

3.4 Network Layer (5.4). There are two components defined for Layer 3 communications in the MIL-STD-188-220A to provide an Intranet protocol and a subnetwork dependent convergence function (SNDCF). The present SINCGARS SIP IP Network System implementation includes both the Intranet protocol and the SNDCF.

3.4.1 Intranet Protocol (5.4.1). The SINCGARS SIP IP Network System Intranet protocol provides the functionality described in 5.4.1 of MIL-STD-188-220A.

3.4.1.1 Intranet Header (5.4.1.1). The Intranet header is implemented in the present SINCGARS SIP IP Network System as specified in 5.4.1.1 of MIL-STD-188-220A.

3.4.1.1.1 Version (5.4.1.1.1). This field is implemented as specified in 5.4.1.1.1 of MIL-STD-188-220A.

3.4.1.1.2 Message Type (5.4.1.1.2). This field is implemented as specified in 5.4.1.1.2 of MIL-STD-188-220A.

3.4.1.1.3 Intranet Header Length (5.4.1.1.3). This field is implemented as specified in 5.4.1.1.3 of MIL-STD-188-220A.

3.4.1.1.4 Type of Service (5.4.1.1.4). The type of service (TOS) field in the Intranet header is intended to be a direct copy of the IP TOS field. As such, the bit ordering indicated in 5.4.1.1.4 of MIL-STD-188-220A for this field is inconsistent with the IP (RFC 791) TOS field bit ordering. The TOS field bit ordering for the Intranet header is that specified in RFC 791 for IP. This change is agreed to by the CNR Implementors Working Group.

3.4.1.1.5 Message Identification Number (5.4.1.1.5). This field is implemented as specified in 5.4.1.1.5 of MIL-STD-188-220A.

3.4.1.1.6 Maximum Hop Count (5.4.1.1.6). This field is implemented as specified in 5.4.1.1.6 of MIL-STD-188-220A.

3.4.1.1.7 Destination/Relay Status Byte (5.4.1.1.7). This destination/relay status byte is implemented as specified in 5.4.1.1.7 and 5.4.1.1.7.1 through 5.4.1.1.7.5 of MIL-STD-188-220A.

3.4.1.1.7.1 Distance (5.4.1.1.7.1). The distance subfield of the destination/relay status byte is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.1.7.1 of MIL-STD-188-220A.

3.4.1.1.7.2 REL Bit (5.4.1.1.7.2). The REL subfield of the destination/relay status byte is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.1.7.2 of MIL-STD-188-220A.

3.4.1.1.7.3 S/D Bits (5.4.1.1.7.3). The S/D bit is used to identify the type Intranet Relay being used. This subfield is implemented per 5.4.1.1.7.2 of MIL-STD-188-220A which presently indicates that the Source Directed Relay specified in Appendix I of MIL-STD-188-220A is implemented in the SINCGARS SIP IP Network System

3.4.1.1.7.4 DES Bit (5.4.1.1.7.4). The DES subfield of the destination/relay status byte is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.1.7.4 of MIL-STD-188-220A.

3.4.1.1.7.5 ACK (5.4.1.1.7.5). The ACK subfield of the destination/relay status byte is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.1.7.5, and the Intranet acknowledgment procedures are implemented as specified in 5.4.1.1.7.5.1 through 5.4.1.1.7.5.4 of MIL-STD-188-220A.

3.4.1.1.8 Originator Address (5.4.1.1.8). The originator address field of the Intranet header is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.1.8 of MIL-STD-188-220A.

3.4.1.1.9 Destination/Relay Address (5.4.1.1.9). The destination/relay address field of the Intranet header is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.1.9 of MIL-STD-188-220A.

3.4.1.2 Topology Update (5.4.1.2). The topology update structures and process are implemented in the SINCGARS SIP IP Network per section 5.4.1.2 and Appendix B of MIL-STD-188-220A.

3.4.1.2.1 Topology Update Length (5.4.1.2.1). The topology update length field of the topology update structure is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.2.1 of MIL-STD-188-220A.

3.4.1.2.2 Topology Update ID (5.4.1.2.2). The topology update ID field of the topology update structure is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.2.2 of MIL-STD-188-220A.

3.4.1.2.3 Node Address (5.4.1.2.3). The node address field of the topology update structure is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.2.3 of MIL-STD-188-220A. It is noted that the link layer address is a 7-bit value and the LSB of this address field is either the command/response (C/R) bit or extension bit. The C/R bit/extension bit is not carried forth to the node address. Per CNR Implementors Working Group Agreement, the seven least significant bits of the node address field represent the link layer address and the eighth bit (MSB) is binary zero.

3.4.1.2.4 Node Status Byte (5.4.1.2.4). The node status byte field of the topology update structure is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.2.4 of MIL-STD-188-220A.

3.4.1.2.4.1 Link Quality (5.4.1.2.4.1). The link quality subfield structure of the node status byte is implemented per 5.4.1.2.4.1 of MIL-STD-188-220A, although the link quality subfield is not utilized because a two-way link quality assessment field and link quality (0 - 7) descriptors are needed to provide the information required for Intranet Relay.

3.4.1.2.4.2 Hop Length (5.4.1.2.4.2). The hop length subfield structure of the node status byte is implemented per 5.4.1.2.4.2 of MIL-STD-188-220A.

3.4.1.2.4.3 NR (5.4.1.2.4.3). The NR bit subfield structure of the node status byte is implemented per 5.4.1.2.4.3 of MIL-STD-188-220A.

3.4.1.2.4.4 Quiet (5.4.1.2.4.4). The quiet bit subfield structure of the node status byte is implemented per 5.4.1.2.4.4 of MIL-STD-188-220A. This bit is presently not in use pending a more detailed specification of the quiet node process.

3.4.1.2.5 Node Predecessor Address (5.4.1.2.5). The node predecessor address field of the topology update structure is implemented in the SINCGARS SIP IP Network System as specified in 5.4.1.2.3 of MIL-STD-188-220A.

3.4.1.3 Topology Update Request Message (5.4.1.3). The Topology Update Request message is implemented in SINCGARS SIP IP Network System as specified in 5.4.1.3 of MIL-STD-188-220A and the CNR Implementors Working Group agreement that the Topology Update Request Message may be addressed to multiple destinations. Addressing of the Topology Update Request Message is clarified paragraph 5.8 of this document.

3.4.1.4 Intranet Layer Interactions (5.4.1.4). The means by which the Intranet Layer of the SINCGARS SIP IP Network System interacts with the next higher layer is accomplished through the primitive functionality described in MIL-STD-188-220A for the IL_unitdata.request, IL_unitdata.indication, and IL_status.indication

3.4.2 Subnetwork Dependent Convergence Function (SNDCF) (5.4.2). The SNDCF is implemented in the SINCGARS SIP IP Network System as indicated in 3.4.2.1 through 3.4.2.4 below.

3.4.2.1 Determine Destination Function (5.4.2.1). The determine destination function is implemented in the SINCGARS SIP IP Network System as specified in 5.4.2.1 of MIL-STD-188-220A.

3.4.2.2 Address Mapping Function (5.4.2.2). The address mapping function is implemented in the SINCGARS SIP IP Network System as specified in 5.4.2.2 of MIL-STD-188-220A.

3.4.2.3 Type of Service Function (5.4.2.3). The type of service function is implemented in the SINCGARS SIP IP Network System as specified in 5.4.2.3 of MIL-STD-188-220A.

3.4.2.4 Intranet Send Request (5.4.2.4). The Intranet Send Request is implemented in the SINCGARS SIP IP Network System as specified in 5.4.2.4 of MIL-STD-188-220A.

4 Appendix A - Abbreviations and Acronyms. This Appendix contains abbreviation and acronym definitions and is not germane to the SINCGARS SIP IP Network System implementation.

5 Appendix B - Intranet Topology Update. This appendix provides detailed information concerning the Intranet Protocol topology update process permitted in MIL-STD-188-220A.

5.1 Spanning Trees (B3.1). Network topology information is stored as a spanning tree graph in the SINCGARS SIP IP Network System, as specified in B3.1 of MIL-STD-188-220A.

5.2 Exchanging Spanning Trees (B4.1). The SINCGARS SIP IP Network System exchanges spanning tree information per B4.1 of MIL-STD-188-220A.

5.3 Topology Tables (B4.2) Topology tables are maintained in the SINCGARS SIP IP Network System after the manner described in B4.2.

5.4 Sparse Spanning Trees (B4.3). Sparse spanning trees are exchanged with other network nodes by the SINCGARS SIP IP Network System to conserve bandwidth utilization. The MIL-STD-188-220A indicates that redundant branches in a spanning tree are pruned to create a sparse spanning tree for transmission. The SINCGARS SIP IP Network System prunes the paths to duplicate nodes according to the following rules.

a. Only the shortest path from the root node to another node is retained, all others are pruned.

b. For redundant paths from a root node to another node which are the same length, at most two are retained.

5.5 Rules for Exchanging Topology Updates (B4.4). The SINCGARS SIP IP Network System adheres to the rules for exchanging topology updates specified in B4.4 and B4.4.1 through B4.4.3 of MIL-STD-188-220A.

5.6 Non-Relayers (B4.5). Per agreement with the CNR Implementors Working Group, in a Topology Update broadcast the non-relayer indicates its status by setting the NR-bit to binary 1 in its entry of the Topology Update. Additionally, the non-relayer includes all one hop neighbors in its Topology Update broadcast because relaying by this node is not permitted. As indicated in B4.5 of MIL-STD-188-220A, the non-relayer node remains in the sparse spanning tree of other nodes but do not have any subsequent branches.

5.7 Quiet Nodes (B4.6). Quiet node indication in Topology Update messages is implemented per B4.6 of MIL-STD-188-220A, although quiet mode operation requires better definition in the standard.

5.8 Topology Update Request Message (B4.7). The Topology Update request message is implemented per B4.7, except for the two conditions below, per agreement with the CNR Implementors Working Group.

a. The Topology Update Request may also be sent whenever a data link transmission is detected from a previously unknown neighbor.

b. While the Topology Update Request is individually addressed at the Intranet Layer (Layer 3A), the broadcast address may be used at the link layer, if deemed appropriate to conserve bandwidth.

6 Appendix C - Net Access Control Algorithm. This appendix provides detailed information concerning the net access control mechanisms permitted in MIL-STD-188-220A.

6.1 Net Busy Sensing Function. Net busy sensing functions are performed by the SINCGARS SIP RT, as the first level of detection, and then passed to the SINCGARS SIP IP Network System for further interpretation.

6.1.1 Data Net Busy Sensing. This function is performed by the SINCGARS SIP RT. Refer to 6.1 above.

6.1.2 Voice Net Busy Sensing. This function is performed by the SINCGARS SIP RT. Refer to 6.1 above.

6.1.3 Net Busy Detect Time. This function is performed by the SINCGARS SIP RT. Refer to 6.1 above.

6.2 Response Hold Delay. The response hold delay (RHD) is implemented in the SINCGARS SIP IP Network System per C3.2 of MIL-STD-188-220A and the descriptions below. The MIL-STD-188-220A section for RHD contains many paragraphs and equations all listed under one heading, C3.2. The numbering below is organized for easy reading in this document and the numbers do correlate to subparagraphs in the MIL-STD-188-220A.

6.2.1 RHD timers. The equations used to calculate RHD(0) and RHD(i) in the SINCGARS SIP IP Network System are defined below. The variables used in each equation are also defined below.

[1] $RHD(0) = KT + E + T + S$

where the SINCGARS SIP IP Network System specific interpretations of the general Appendix C term definitions appear below.

KT [keytime] - the time from when the SINCGARS SIP IP Network System indicates it has data to send to the SIP RT (by raising 'C' lead and transmitting flags on 'T' lead) until flags are returned by the radio.

E [equipment turnaround] - the sum of the following components

a. the time for either the sending SIP RT or receiving SIP RT (whichever is greater) to turnaround and be ready to send or receive.

b. the time from when the last bit of data is sent by the transmitting SINCGARS SIP IP Network System until the last same bit of data is delivered to the receiving SINCGARS SIP IP Network System.

T [tolerance] - slop factor

S [Type 1 ACK time] - the time to generate and send a Type 1 response from the SINCGARS SIP IP Network System to the SIP RT.

[2] RHD(i) = (i-1) x RHD(0) + E - C

where the SIP/SINCGARS SIP IP Network System specific interpretations of the general Appendix C term definitions appear below.

RHD(0) - [as defined above]

E - [as defined above]

C - crypto timing not separately calculated for SIP RT, hence= 0

i - the individual station's position in the destination portion of the address field of the original Type 1 ACK (P-bit=1) message. The 'i' value falls within the allowable (by 188-220A) range of 1 - 16. The reality is that with the IP multi-destination option, the number destination addresses will never be greater than nine. If the security option field is also used, this number will never be greater than seven.

6.3 TP timers. The equations used to calculate TP timers in the SINCGARS SIP IP Network System are defined below. The variables used in each equation are also defined below.

If a Type 1 ACK is requested (P-bit=1),

[3] TP = j x RHD(0) + E - C + xd

where the SIP/SINCGARS SIP IP Network System specific interpretations of the general Appendix C term definitions appear below.

j - the total number of individual and special addresses for this transmitted frame.

RHD(0) - [as defined above]

E - [as defined above]
C - [as defined above]
xd - [Transmission Delay to ensure all neighbor nodes received the UI (P-bit = 1) PDU - length 800 msec]

If a Type 1 ACK is not requested (P-bit = 0),

[4] TP = E - C

where the SIP/SINCGARS SIP IP Network System specific interpretations of the general Appendix C term definitions appear below.

E - [as defined above]
C - [as defined above]

If a net access attempt results in a collision, a TP Access timer shall be set to resolve the collision. This TP Access timer functions in a manner similar to the Ethernet LAN "back-off" CSMA/CD timer which is set to resolve collisions on the LAN media.

[5] TP Access = (E - C) + x_rnd

where the SIP/SINCGARS SIP IP Network System specific interpretations of the general Appendix C term definitions appear below.

E - [as defined above]
C - [as defined above]

x_rnd - a random time value over the range of 50 msec - 500 msec.

When an unexpected Type 1 coupled acknowledgment URR Response PDU is received,

[6] TP = 15 x RHD(0) + E - C

where the SIP/SINCGARS SIP IP Network System specific interpretations of the general Appendix C term definitions appear below.

RHD(0) - [as defined above]

E - [as defined above]
C - [as defined above]

6.3.1 Summary of Type 1 (P-bit=1) Acknowledgment Procedures. The paragraphs below summarize the Type 1 (P-bit=1) acknowledgment procedures implemented in the SINCGARS SIP IP Network System.

6.3.1.1 Transmitter. When the transmitting link layer receives a physical layer indication that the Type 1 (P-bit=1) PDU was sent, the TP timer per equation [3] is started. Upon expiration of the TP timer, data may be sent to the SINCGARS SIP RT. If this transmission attempt fails due to collision or busy channel, the TP Access timer per equation [5] is started. Upon expiration of the TP Access timer, data may be sent to the SINCGARS SIP RT.

6.3.1.2 Receiver. Upon receipt of a Type 1 (P-bit=1) PDU, both the RHD(i) timer per equation [2] and TP timer per equation [3] are simultaneously started. When the Type 1 PDU is not addressed to the local station, only the TP timer is started. Upon expiration of the RHD(i) timer, the Type 1 (F-bit=1) coupled ACK URR response PDU shall be sent to the SINCGARS SIP RT

for transmission, unless the net becomes busy causing discard of the URR PDU. Upon expiration of the TP timer, data may be sent to the SINCGARS SIP RT. If this transmission attempt fails due to collision or busy channel, the TP Access timer per equation [5] is started. Upon expiration of the TP Access timer, data may be sent to the SINCGARS SIP RT.

6.3.1.3 Contingencies. The following contingencies are relevant to the SINCGARS SIP IP Network System implementation of the Type 1 (P-bit=1) acknowledgment procedure.

a. If an unexpected Type 1 (F-bit=1) coupled ACK URR Response PDU is received, i.e. there was no existing Type 1 procedure (indicating that the original Type 1 coupled ACK UI PDU was not 'heard'), the TP timer as per equation [6] is started. Upon expiration of this TP timer, data may be sent to the SINCGARS SIP RT.

b. If a Type 1 (P-bit=1) ACK procedure is active and a Type 1 (P-bit=0) PDU is received, the PDU is accepted and passed to the upper layer without any Type 1 (P-bit=1) TP timer suspensions.

c. If a Type 1 (P-bit=1) ACK procedure is active and a new Type 1 (P-bit=1) UI PDU is received, the ongoing procedure is aborted and the new Type 1 (P-bit=1) ACK procedure is honored.

d. If a Type 1 (P-bit=1 or 0) procedure is active and a Type 4 PDU is received, the PDU is accepted and passed to the upper layer without any timer suspensions.

e. If a Type 4 procedure is active and a Type 1 (P-bit=1) PDU is received, the Type 1 procedure is serviced immediately and the Type 4 timers and the RE-NAD scheduler are suspended. These timers and the scheduler are resumed upon completion of the Type 1 (P-bit=1) ACK procedure.

6.4 Net Access Delay (C3.4). In the SINCGARS SIP IP Network System the net access delay procedures are shared between the DTE and the SINCGARS SIP RT. Only the Radio-Embedded Net Access Delay (RE-NAD) procedures of MIL-STD-188-220A Appendix C are presently implemented in the SINCGARS SIP IP Network System.

6.4.1 Random Net Access Delay (C3.4.1). The random net access delay (R-NAD) procedure is not implemented in the SINCGARS SIP IP Network System.

6.4.2 Prioritized Net Access Delay (C3.4.2). The prioritized net access delay (P-NAD) procedure is not implemented in the SINCGARS SIP IP Network System.

6.4.3 Hybrid Net Access Delay (C3.4.3). The hybrid net access delay (H-NAD) procedure is not implemented in the SINCGARS SIP IP Network System.

6.4.4 Radio-Embedded Net Access Delay (RE-NAD) (C3.4.4). The radio-embedded net access delay (RE-NAD) procedure is implemented in the SINCGARS SIP IP Network System.

6.4.4.1 RE-NAD Media Access. (C3.4.4.1). The RE-NAD media access 1-persistence mechanism is not implemented in the SINCGARS SIP IP Network System. In the SINCGARS SIP IP Network System "channel unavailable" returns all PDUs in the FMU back to the queue. If a higher precedence PDU is available, the FMU is rebuilt to include the higher precedence PDUs. If there are not any higher precedence PDUs, the same FMU is rebuilt for transmission.

6.4.4.1.1 Random Schedule Interval (C3.4.4.1.1). The RE-NAD algorithm implemented in the SINCGARS SIP IP Network System uses the "continuous scheduler" concept to randomize channel access on a network. The continuous scheduler is dependent on network population, traffic load and local station's recent use of the channel. However, because Intranet Relay is currently not being used, the present scheduler is not influenced by network connectivity, as indicated in C3.4.4.1.1. The Tc interval timer is calculated per C3.4.4.1.1 of MIL-STD-188-220A.

6.4.4.1.2 Calculation of the Scheduler Offset (C3.4.4.1.2). To provide better service to heavy user, the scheduler offset (Toffset) is presently fixed at 2 seconds.

6.4.4.1.3 Calculation of the Scheduler Random Parameter (C3.4.4.1.3). The scheduler random parameter (schedint) is calculated per the equation below.

schedint = [(Toffset * no. of net nodes)/16] * Fload

The schedint is recomputed after every transmission by the SINCGARS SIP IP Network System.

6.4.4.1.4 Calculation of the Scheduling Factor (C3.4.4.1.4). With the Intranet Relay turned off the scheduling factor is equivalent to the load factor per below.

Fsched = Fload

6.4.4.1.4.1 Calculation of the Partition Factor (C3.4.4.1.4.1). The partition factor (Fpart) calculation is implemented per C3.4.4.1.4.1 of MIL-STD-188-220A in the SINCGARS SIP IP Network System. With Intranet Relay turned off the Fpart is not evaluated.

6.4.4.1.4.2 Calculation of the Topology Factor (C3.4.4.1.4.2). The topology factor (Ftop) calculation is implemented per C3.4.4.1.4.2 of MIL-STD-188-220A in the SINCGARS SIP IP Network System. With Intranet Relay turned off the Ftop is not evaluated.

6.4.4.1.4.3 Calculation of the Load Factor (C3.4.4.1.4.3). The load factor (Fload) is calculated per C3.4.4.1.4.3 of MIL-STD-188-220A.

6.4.4.1.5 Immediate Mode Scheduling (C3.4.4.1.5). There are two immediate mode scheduling types described in C3.4.4.1.5 of MIL-STD-188-220A, 0-sec immediate mode; and 100ms immediate mode. The 0-sec immediate mode scheduling is implemented in the SINCGARS SIP IP Network System for both Type 1 UnACK and Coupled ACK

6.4.4.2 RE-NAD Net Access (C3.4.4.2). The RE-NAD net access implementation in the SINCGARS SIP IP Network System is compliant with C3.4.4.2.

6.4.4.3 Net Busy Sensing and Receive Status (C3.4.4.3). The RE-NAD net busy sensing and receive status implementation in the SINCGARS SIP IP Network System is compliant with C3.4.4.3.

6.4.5 Deterministic Adaptable Priority Net Access Delay (DAP-NAD) (C3.4.5). The DAP-NAD procedure is not implemented in the SINCGARS SIP IP Network System.

6.5 Voice/Data Net Sharing (C3.5). The SINCGARS SIP IP Network System is used on mixed voice/data nets. Adherence to the seven subcomponents (a - g) of C3.5 are indicated below.

a. The first level of voice reception is implemented in the SINCGARS SIP RT. The voice detection in the SINCGARS SIP IP Network System is compliant with paragraph 6.5a of MIL-STD-188-220A.

b. This subparagraph is adhered to by the SINCGARS SIP IP Network System for Type 1 operations but is not applicable to Type 4 packet mode operations where Tc is the primary timer.

c. The SINCGARS SIP IP Network System adheres to this subparagraph.

d. The P-NAD procedure is not implemented in the SINCGARS SIP IP Network System.

e. Media access control timers are suspended for operations and resumed at the conclusion of voice operations in the SINCGARS SIP IP Network System to minimize channel access contention.

f. The SINCGARS SIP IP Network System adheres to this subparagraph.

g. Data link concatenation in the SINCGARS SIP IP Network System is selectively enabled or disabled based on the value of the corresponding MIL-STD-188-220A MIB parameter. However the MIB is set to Data Priority and it is read only at this time

7. Appendix D - Communications Security Standards. COMSEC is performed by the SINCGARS SIP RT and, as such, is not implemented in the SINCGARS SIP IP Network System.

8. Appendix E - Data Link Management Process. This appendix is presently undergoing revision by the CNR Implementors Working Group to support mobility. The 27 July 1995 Appendix E is not implemented in the SINCGARS SIP IP Network System.

9. Appendix F - Golay Coding Algorithm. Forward error correction Reed-Solomon coding is performed by the SINCGARS SIP RT and, as such, is not implemented in the SINCGARS SIP IP Network System.

10. Appendix G. This Appendix is deleted in the 27 July 1995 publication of MIL-STD-188-220A.

11. Appendix H. This Appendix is deleted in the 27 July 1995 publication of MIL-STD-188-220A.

12. Appendix I Source Directed Relay. The SINCGARS SIP IP Network System implementation of the source directed relay process is indicated in the paragraphs below.

12.1 Forward Routing (I4.1). The SINCGARS SIP IP Network System implementation of the forward routing process used at Layer 3A is as specified in I4.1 of MIL-STD-188-220A.

12.2 End-to-End Acknowledgment (I4.2). The SINCGARS SIP IP Network System implementation of the end-to-end acknowledgment process used at Layer 3A is as specified in I4.2 of MIL-STD-188-220A.

12.3 Relay Processing (I5.4). The SINCGARS SIP IP Network System implementation of the forward relay process used at Layer 3A is as specified in I5.4 of MIL-STD-188-220A.